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Prediction of Wind Energy Resources (PoWER) User's Guide

by David P Sauter

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14. ABSTRACT

Electric power generation from portable-type wind generators can be used in a tactical military environment to provide and/or augment power requirements. This technical report describes an easy to use mobile application that determines how much energy can be generated on a daily basis.

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1. Introduction

The Prediction of Wind Energy Resources (PoWER) application (henceforth referred to as the "app") provides information on the instantaneous electrical power and energy that can be generated by a wind generator. The amount of power produced is a function of the wind speed, temperature, pressure, generator rotor diameter, and overall generator efficiency. PoWER is intended to support tactical power generation and augmentation via the use of primarily portable-type wind generators (although it can also be used for fixed-site generators). PoWER is hosted on Apple iOS and Android (mobile device operating systems) based smartphones and tablets (referred to from here on as the "device"). The functionality is identical between the iOS and Android device and the screen displays are similar between the 2 operating systems. The most significant difference between the 2 is the tabbed window titles are shown at the top of the Android device, and at the bottom of the iOS device. Figures 1–5 are screen captures from an iOS emulator.

2. PoWER Inputs

To launch the PoWER application, tap the PoWER icon on the mobile device (Fig. 1). The initial input tab is then displayed for the user to enter the meteorological (MET) information (Fig. 2). The atmospheric density is computed on the device from the pressure and temperature values as input by the user. The lower the density the lower the power output of the generator. Inputs for the MET and generator (GEN) parameters are range-checked by the app to ensure valid entries.
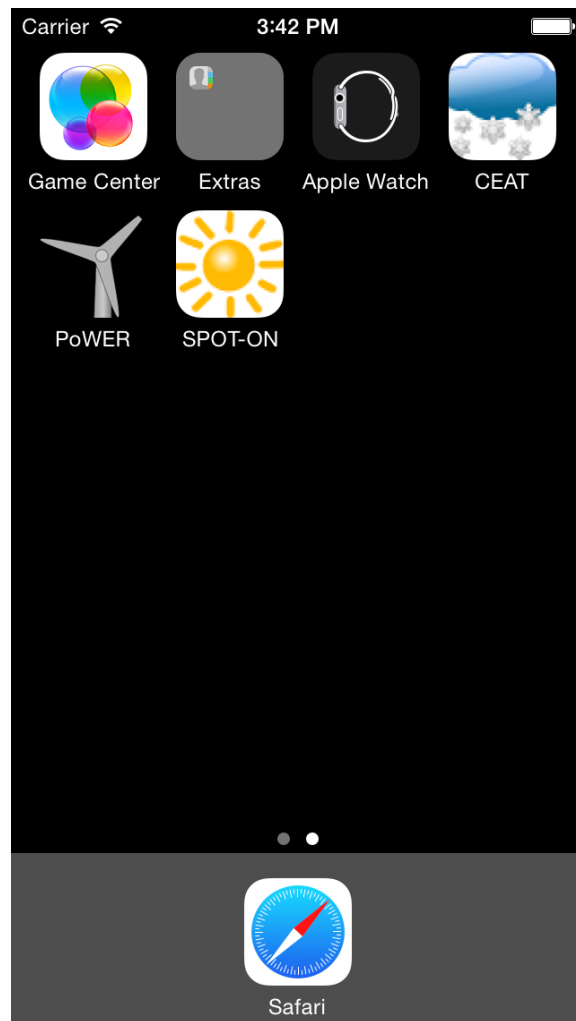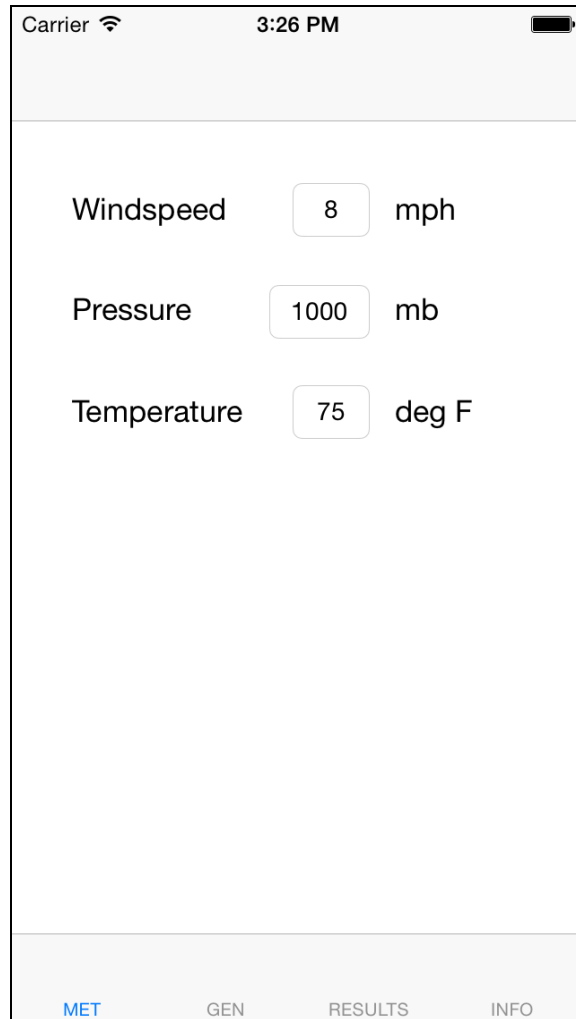
Fig. 1   Launch PoWER

Fig. 2   MET view

Figure 3 displays a screen capture of the GEN tab that allows user entry of the generator's rotor diameter in meters, and the power efficiency that represents the overall efficiency of the generator in converting wind energy into electrical energy. The screen capture in Fig. 3 is displayed by tapping the GEN tab at the bottom of the app display.
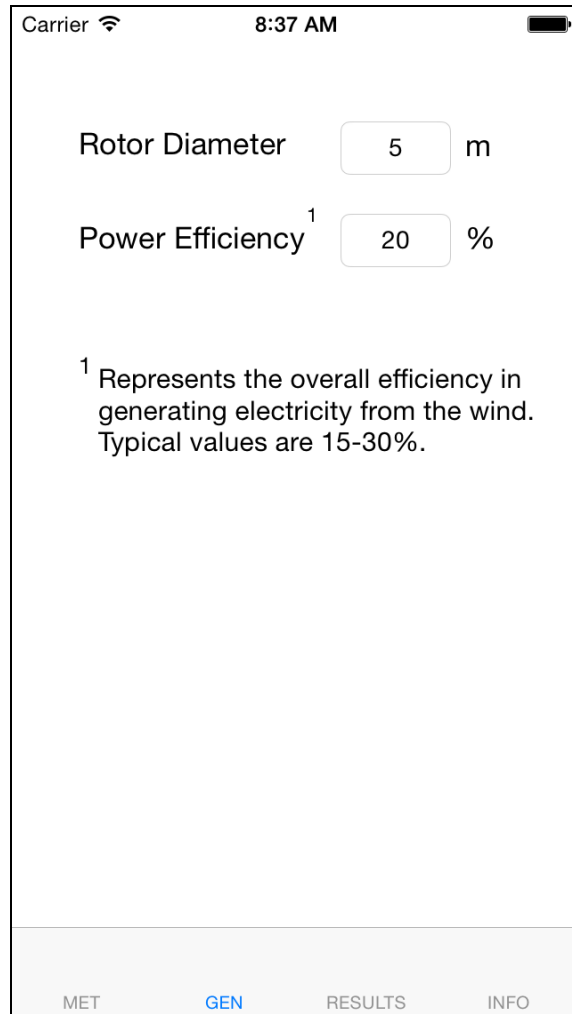
Fig. 3   GEN view

3.   PoWER Output

Tapping the RESULTS tab calculates and displays (Fig. 4) the total electrical energy generated within a 24-h period, and tapping "RESULTS" also calculates and displays the instantaneous power output. It is assumed that all of the input parameters are constant during the 24-h period. If multiple generators of the same size are deployed, the total energy generated can be obtained by simply multiplying the result by that number of generators.

The final tab shown (Fig. 5) provides point of contact information as well as the version of the installed app.

Upon exiting the app, current values for all of the user inputs are stored internally and they will be the default values displayed when the app is launched again.
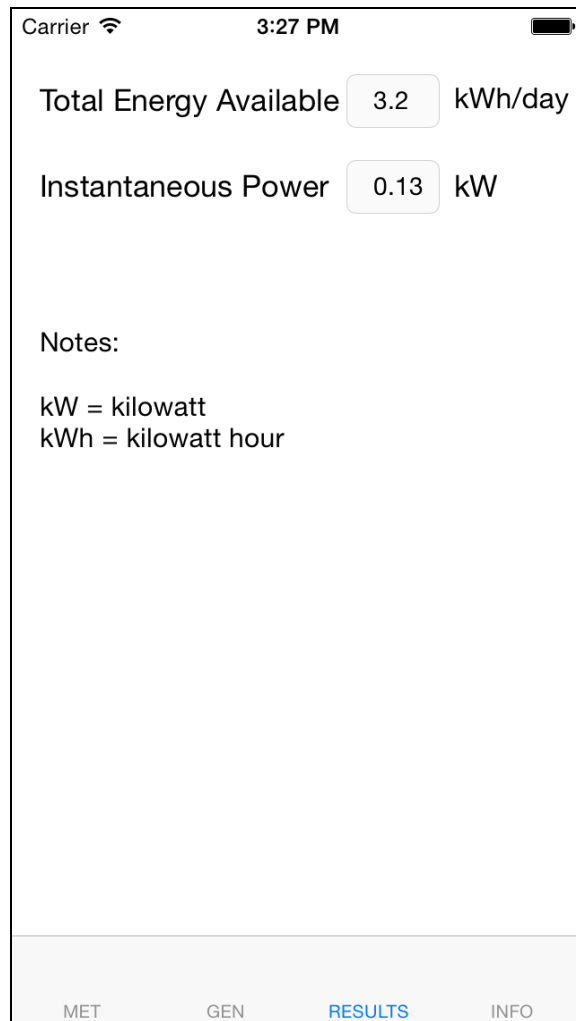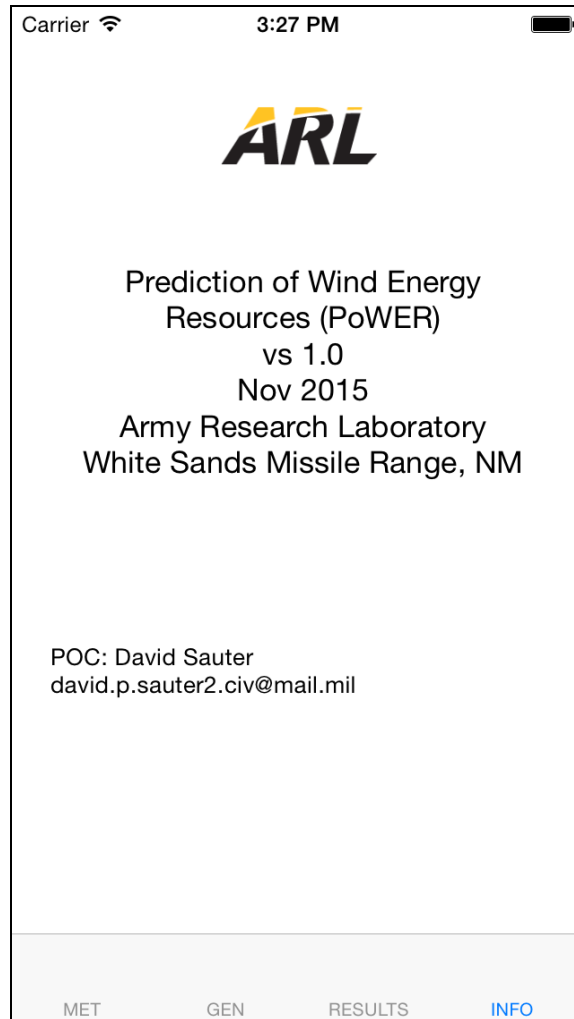
Fig. 4   RESULTS view

Fig. 5　INFO view

4.　Summary

PoWER provides an easy to use capability to estimate available electrical energy and power generation given simple readily available inputs. Hosting on a mobile device makes it accessible virtually anywhere in a tactical environment.

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